

# BULLETIN OF MISCELLANEOUS INFORMATION

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## ROYAL BOTANIC GARDENS, KEW

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### XLVIII.—THE BANANA IN SOME TROPICAL EASTERN COUNTRIES—ITS FORMS AND VARIATIONS.

F. N. HOWES.

During the early part of the year visits were paid to certain countries in the East, chiefly for the purpose of obtaining living material of some of the better forms of cultivated banana. These visits were carried out under the auspices of the Empire Marketing Board in connection with the campaign that is now being carried on against "Panama Disease" (*Fusarium cubense*) in the commercial banana growing areas of the Empire. It is a matter of common knowledge that the "Gros Michel" or "Jamaica" banana, which is the variety extensively grown in the West Indies and Caribbean region, is a ready victim to the ravages of this disease, and the desirability of obtaining a variety that complies with the demands of the trade, and which is at the same time highly resistant to, or immune from "Panama Disease" is obvious. The extent to which the varieties chosen may be resistant to the disease can, of course, only be ascertained after they have been established in the West Indies from young plants of these varieties sent out from Kew.

In addition to forms of cultivated banana (seedless), material of the larger fingered seeding Musas was required. The possible value of these seeding types lies in their use as female parents in breeding work. They have proved largely to be resistant to "Panama Disease," and the possibility of obtaining eventually a hybrid, or strain, combining the resistance of the original female parent with the fruit characters of an "edible" male parent is apparent.

Among cultivated bananas, material was selected only of those that possessed superior edible qualities and were regarded as being promising commercial types. As this selection involved a survey of all the varieties encountered in the East it was possible to make observations on a large number of varieties and to record their characteristics, and to a certain degree their distribution, particularly of those that are extensively cultivated and occur in several distinct regions. It is proposed in this article, therefore, to deal with this aspect of the investigation, and, in dealing with the more important varieties, not to be limited entirely to those that are regarded as potential shipping bananas. The countries visited were British Malaya, Java, Siam, Burma, S. India and Ceylon.

In dealing with varieties it will be noticed that they are referred to entirely by vernacular names. The reason for this is that a botanical nomenclature, or systematic classification for cultivated bananas has not as yet been drawn up for any of the countries visited. Furthermore, European common names for varieties exist in only a very few instances. The names used throughout this article are those that are well recognised and established in the better known languages such as Siamese, Burmese, Malay, Tamil and Ceylonese. Names belonging to any of the lesser-known dialects have been excluded. To attempt to draw up a botanical classification of banana varieties in any of the countries visited was, in the circumstances, quite impossible, as anyone familiar with the multiplicity of forms occurring in the East will readily recognise. This is a task that can only be attempted by one who is resident for some time in one of these countries and is able carefully to observe the different varieties in their different stages of development.

Although the number of varieties cultivated in all the Eastern tropical countries visited is large, it is usual for almost all the fruit produced in any one area to be supplied by some three or four varieties only. In some areas—particularly Siam—some of the varieties are very rare and are seldom met with for sale on the native markets. They are reserved as far as possible for festive occasions and are given as presents to priests and other dignitaries. Some varieties are very localised in their distribution and are very probably endemic. Others on the other hand have a wide range of distribution, existing under different native names in different countries. A glance at the table of synonyms on page 307 illustrates this point. The varieties most esteemed by Asiatics are not necessarily those favoured by Europeans. Similarly in some cases varieties thought highly of by Europeans have no such great appeal to the Oriental. The distinction between table and cooking bananas, or “bananas” and “plantains,” is not so marked in the East as in Africa and elsewhere, probably on account of the far greater number of varieties. Those that are used both for eating in the uncooked state and for cooking form a very large class.

It is interesting to note the wide range and extent of cultivation of the Cavendish or Canary banana (*Musa Cavendishii* Lam.) in the East. It was encountered in all the countries visited except Siam. The “Cavendish” is commonly regarded as a sub-tropical rather than a tropical species and its success in some of the low-lying areas of Burma and Southern India is therefore all the more remarkable.

With regard to bananas of the “Gros Michel” type, these were met with in Malay, Java, Siam, Burma and Ceylon, but not in southern India. In Malay the varieties “Pisang embon” and “Pisang hijau” fall under this category; in Burma two forms of the variety known as “Thihmwe,” and in Siam the several forms belonging to the group “Klui-hom.” In Ceylon the “Anamalu” forms may be taken as the representatives. My observations lend

TABLE SHOWING SYNONYMOUS NATIVE NAMES OF CULTIVATED VARIETIES.

MALAY and JAVA (Malay)	Pisang maas	Pisang embon			Pisang serandah	Pisang batu (of Java)	Pisang abu	Pisang masak hijau	Pisang rajah udang	Pisang batu (of Malay)
SIAM (Siamese)	Klui kai	Klui hom	Klui nam wa	Klui ferong		Klui humuk		Klui hom kieu	Klui naak	Klui tani
BURMA (Burmese)		Thihmwe	Yakhine	Htaw-bat	Wet-ma- lut	Hpi-gyan		Thihmwe	Shwe- hngat- pyaw	
S. INDIA (Tamil)				Rastali	Pacha- wara	Pajan			Sawara	Puven
CEYLON (Singalese)		Anamalu				Monthan	Alu kehel	Hapu- mal anamalu	Ratem- bala	Puwalu

Names in the same vertical column refer to the same variety.



support to the theory that south-eastern Asia is the original home of the "Gros Michel" type. It must be remembered, however, that these observations were limited to a portion of south-eastern Asia only. The large number of forms that occur here, closely allied to, if not altogether identical with, the "Gros Michel," point to the antiquity of this type. Its presence in several forms in Ceylon, but its absence from southern India, as far as could be ascertained, is peculiar and suggests that the Ceylon forms may have originated through the agency of man from countries further East—the Malay Archipelago or Indo-Malaya. What part of south-eastern Asia is to be regarded as the original home of the "Gros Michel" type will no doubt always remain a mystery.

A number of varieties in the East which are usually seedless were occasionally found with one or two apparently normal seeds in a finger. Possibly if grown at a fairly high altitude in Jamaica or the West Indies, seeding would be found to be less sporadic and the varieties would prove of use as female parents in breeding work. Furthermore, the subsequent elimination of the seeding factor would probably present no great difficulty as may be found to be the case with the wild seeding Musas.

I am indebted to numerous people in the countries visited for the assistance and information they so kindly gave. In British Possessions the Directors of Agriculture and members of their staffs were most helpful. In Java the Director and Curator of the Botanic Gardens, Buitenzorg, and in Siam, Dr. Kerr of the Ministry of Commerce, members of the Agricultural Department, and Mrs. Collins of Sriracha, very kindly gave me great help with their knowledge of local conditions, and rendered me every possible service.

### **Cultivated Bananas.**

#### **MALAYAN VARIETIES.**

In Malaya the Malay word "pisang" is used throughout for banana and the different varieties are denoted by the word "pisang" plus a descriptive adjective which has a bearing on some peculiarity about the variety, *e.g.*, "Pisang serendah," the Dwarf or Cavendish Banana (serendah=short).

"Pisang embon." (Plate III, fig. 2).

This variety is very largely grown in most parts of Malay and is quite one of the most popular varieties among both Asiatics and Europeans. The bunches, except when adverse conditions prevail, are large and compact. The hands are evenly spaced and the fingers, which are large, well filled, and of uniform thickness, are generally curved in the neighbourhood of the pedicel and lie adjacent to one another throughout the greater part of their length.

The fruit is of excellent flavour with a pale cream-coloured flesh, rather dry and of a close even texture. On ripening it assumes generally a dull yellow colour. So closely does this variety resemble the "Gros Michel" or "Jamaica" that it is regarded by many as

PLATE III.

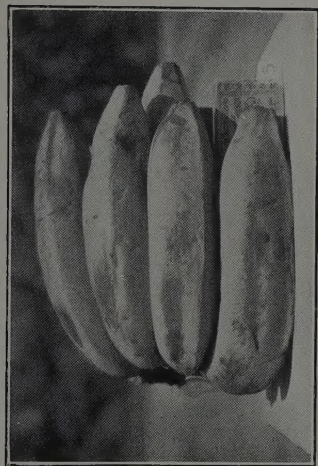


Fig. 2. Pisang embon, Malay.



Fig. 4. Pisang rastali, Malay.



Fig. 1. Pisang rajah, Malay.

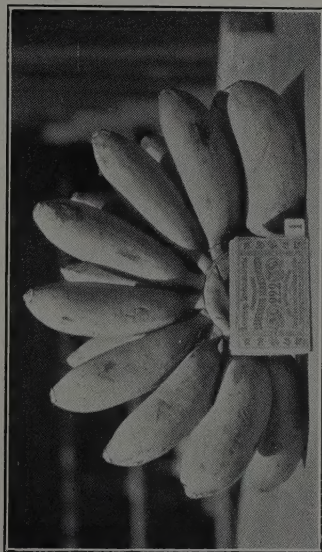


Fig. 3. Pisang maas, Malay.



PLATE IV.



Pisang serendah, Malay.

being identical with it. Well grown plants up to fifteen feet in height were seen in some localities, with sturdy erect pseudostems generally mottled a good deal with black markings. The leaf sheaths near the point of attachment to the petiole are covered with a white waxy substance in the young stages. The usual number of hands per bunch in the Serdang area, near Kuala Lumpur, F.M.S., was 8 or 9, and the number of fingers per hand 16 or 17. The fingers are from 7 to 8 inches in length and  $1\frac{1}{2}$  inches in diameter.

This variety is regarded as likely to comply with the demands of the trade in every way, but it is feared that it offers very poor resistance to certain vascular diseases (Panama?), as will be seen from observations made in the State of Negri Sembilan which are dealt with among the remarks on Cultivation and Diseases (page 325). This variety, it was found, was known as "Pisang embon" over the greater part of Malay, but in and around Penang the name "Pisang bunga" was frequently used.

"Pisang masak hijau."

This variety, sometimes called "Pisang hijau" (masak=ripe: hijau=green), is characterised by being yellow-green when ripe and never attaining to a truly yellow colour. This feature distinguishes it from all other Malayan varieties and accounts for the descriptive Malay name by which it is known.

The habit of the plant, size and shape of the bunches and fingers, are identical with those of "P. embon." The flesh, however, is not so dry and is of a sweet sub-acid flavour. It is regarded as a good dessert banana, but its failure to assume an attractive colour would probably be a serious drawback from the commercial point of view. Furthermore, a tendency for the fingers to fall away from the bunch at an early stage is noticeable in some cases.

"Pisang maas." (Plate III, fig. 3).

This variety, known also as the "Golden Banana" (maas=golden) no doubt on account of the rich orange colour of the ripe fruit, is regarded by many as the most choice of the Malayan varieties. It is cultivated very extensively in some areas and always commands a higher price than other varieties. The fingers are small, not more than 3 inches in length and  $1\frac{1}{2}$  inches in diameter, and stick out more or less at right angles to the stalk of the bunch. The skin is extremely thin, rendering the fruit very liable to bruising. The flesh is orange in colour and of a rich aromatic flavour. In spite of the choice flavour of this variety it could hardly be considered for the export trade, firstly on account of the delicate nature of the fruit, and secondly on account of its small size and bad shape for carrying.

Near Jelibu, in the State of Negri Sembilan, this variety is cultivated very extensively, several hundred acres being under cultivation almost as a pure stand. Though "P. maas" is always a small banana, normally only one third the size and weight of "P. embon," it invariably commands a much higher price than "P.



embon," or any other variety. At the Chinese coffee stalls at Jelibu (Jan. 1928) the price asked for "P. embon" was one cent per banana and for "P. maas" two cents. This indicates that the value of "P. maas" per unit is six times the value of "P. embon" or other varieties according to local native market valuations. Although the quality and flavour of "P. maas" is admittedly good and superior to other varieties, it is difficult to understand why such an elated monetary value should be attached to it. "Pisang maas" is known by the synonym of "Pisang ama manis" in parts of Johore.

"Pisang rajah." (Plate III, fig. 1).

This variety is grown to a fairly large extent but is not so common in Malay as the three varieties already dealt with. In Java, however, it is quite one of the most popular and extensively grown varieties. The plant is of sturdy habit—8 to 12 feet in height, with a purple marking on the two margins of the leaf petiole. The bunches are compact with generally 7 to 8 hands and 14 to 16 fingers per hand. The fingers have rather a pronounced apex and taper gradually to the pedicel at the base, being generally 5 to 6 inches in length. Three or four rather prominent ridges are generally present and the skin is of medium thickness. Ripe fruit is buff in colour with a tendency to retain the green colour slightly along the ridges. The flesh is rather coarse in texture and is cream-coloured round the periphery and orange in the centre. Though of a sweet taste the flavour can only be described as fair. It is a good cooking banana but is rather coarse to find much favour as an eating banana with Europeans.

"Pisang rajah udang."

This is one of the red bananas, and the only red variety encountered in Malay. Pigmentation extends throughout the whole plant except the lamina and is particularly noticeable on the pseudostem and leaf mid-rib. Bunches with 8 to 9 hands were generally seen but no doubt under very favourable conditions considerably larger bunches could be expected. The fruit is a dark red brown when immature, but on ripening assumes a yellow tinge, particularly when exposed to full sunlight. Ripe fruit is well filled with little or no sign of ridging, 5 to 5½ inches in length and 1½ inches in diameter. The flesh is yellow or pale orange in colour and of good flavour.

This variety is not much grown by the native cultivators in Malay, no doubt on account of the popular belief among Malays that it causes a skin complaint to affect those who consume the fruit.

An interesting example of a yellow bud mutant of the red banana ("Pisang rajah udang") was observed on a rubber estate in Eastern Johore. From a single plant of the red banana one of the suckers in a subsequent season was found to bear yellow fruit in place of red. Out of interest the owner removed this sucker and later established other stools from it. Except for lack of pigment throughout, and a



slightly paler flesh, this yellow mutant in no wise differs from the original red form.

“ Pisang serandah.” (Plate IV).

This variety is undoubtedly one of the Cavendish forms (*Musa Cavendishii* Lam. var.) as can be seen from a glance at the dwarfed broad-leaved habit of the plant.

It is the only representative of the Cavendish species seen in Malay and may possibly be of fairly recent introduction, as it appears to be by no means widespread throughout the Peninsula, in spite of the excellent qualities of the fruit and the fact that it grows readily. The fruit of this variety does not assume a rich yellow on ripening but remains green-yellow. Otherwise it is similar to the typical “ Canary ” banana and is of excellent flavour. This variety is probably identical with the “ Wet-ma-lut ” of Burma and “ Pachawara ” of Madras.

“ Pisang rastali.” (Plate III, fig. 4).

The “ Pisang rastali ” of Malay is quite a distinct banana from the “ Rastali ” of Southern India. It is grown a great deal in some areas, particularly Western Johore where an alternative name for the variety is “ Pisang Kling.” These names are suggestive of the variety having been introduced from India at one time or another.

A feature about this variety is that the fruit is not at its best when full yellow but improves in quality and flavour as the skin becomes brown and black. By some it is regarded as not worth eating until it has reached this stage and is almost completely discoloured. Fingers are generally 4 to  $4\frac{1}{2}$  inches long and  $1\frac{1}{4}$  inches in diameter; of uniform thickness and ridges not at all pronounced. The skin is very thin and quickly becomes covered with brown spots, commencing usually at the apex. The flesh is white and of rather a watery, soapy texture. The flavour is pleasant and slightly acid. It is regarded as a good dessert and cooking banana and is a heavy yielder.

In the State of Johore “ P. rastali ” is a very popular variety and is grown extensively, whereas farther north its occurrence is less common. In parts of Batu Pahat, in the west of the State, it is grown more or less to the exclusion of other varieties.

“ Pisang awak betol.”

This variety is interesting in that seeds are frequently found in the fruit. Bunches with 10 hands and 15 to 17 fruits per hand were seen. The fruit tapers to rather a sharp point and is usually  $3\frac{1}{2}$  to 4 inches long and  $1\frac{1}{4}$  inches in diameter, not unlike “ P. rastali ” in shape. The skin is frequently spotted and the flesh pale cream with a sub-acid flavour. Together with “ Pisang awak legor ” the variety is cultivated a good deal in parts of Selangor and fruit can be purchased on the Kuala Lumpur market.

“ Pisang kapas.”

The name given to this variety (kapas=fan) no doubt has reference to the manner in which the young fruits stand out at right angles to the rachis and show no signs of curling over until fairly well developed. This feature is all the more noticeable on account of the hands being situated some distance from one another on the rachis. Bunches with 9 hands averaging 17 fingers per hand were seen. The fingers, 4 to 4½ inches long and only slightly curved, are yellow when ripe with yellow flesh. The lack of compactness in the bunches and tendency for the fingers to stick out disqualified this variety from being of any value as a shipping variety. The flavour furthermore is not good.

“ Pisang brok bakul.”

“ Brok bakul,” signifying “ full basket,” is probably given to this variety on account of its being regarded as a heavy yielder. The plant is characterised by a certain amount of red or pinkish colouration, noticeable particularly on the mid-rib and leaf petiole. Bunches with 8 hands averaging 16 fingers per hand were noticed. The fruit, 5½ inches long, is plump and well filled, with a pedicel about half an inch long. The flesh is pale yellow with a darker area located in the centre. Though a by no means common variety the fruit is of good flavour.

“ Pisang abu.”

“ Pisang abu ” or the “ ash banana ” (abu=ash) is a very distinctive variety in that the fruit is covered with a “ bloom ” or light coating of a white waxy substance. The fruit is 4-4½ inches long and close on 2 inches in diameter with a yellow skin when ripe and white flesh. It is regarded as a cooking variety, and sub-varieties exist.

“ Pisang nangka.”

“ Pisang nangka,” one of the larger cooking bananas, is grown a great deal in Johore. It appears to be sometimes eaten in the raw state when ripe but it is generally picked green and used for cooking purposes. The fruit is 8 to 9 inches in length and up to 1¾ inches in diameter, with a pale yellow flesh.

“ Pisang talon.”

This is no doubt the largest fingered variety in Malaya and is a typical plantain or cooking banana. It is very similar to the variety “ Nendren,” so common on the Malabar Coast in India. Fingers may be almost a foot in length and up to 2½ inches in diameter. The flesh when ripe is of an orange hue.

For brief descriptions of other varieties of Malayan bananas, not included in the above, reference should be made to papers by Milsum and Hales in the Bulletin of the Agric. Dept. of the S.S. and F.M.S. (25, 45).



PLATE V.



Fig. 1.



Fig. 2.

Figs. 1 and 2. Klui tani ban, Siam.

Scale in inches.



Fig. 3.

Fig. 3. Klui nam wa, Siam.

Scale in inches.

PLATE VI.



Fig. 1. Yakhine, Burma.



Fig. 2. Wet-ma-lut, Burma.



## SIAMESE VARIETIES.

### " Klui kai."

This variety as the name indicates (klui=banana, kai=egg) is a small, rather plump-fingered type. It is a most popular variety and very delicately flavoured, being without doubt identical with the " Pisang maas " or Golden Banana of Malay. For further information reference should be made to " Pisang maas " under Malayan varieties.

### " Klui hom."

Another of the commoner varieties which is marketed a good deal in Bangkok is that known as " Klui hom." This is a large-fingered variety of good quality resembling very much the " Jamaica " or " Gros Michel," and similar to the " Pisang embon " of Malay. It was never found, however, attaining to quite such a large size as the " Pisang embon " of Malay. This might be accounted for by the fact that the time of the year when Bangkok was visited was the middle of the dry season when bananas are less well developed than during the rainy months of the year. " Klui hom " exists in four or perhaps five sub-varieties or forms, the differences between which are very slight. The most distinct of these forms is one which remains a green or yellow-green when ripe and never assumes a yellow colour. This form might be regarded, therefore, as corresponding to the " Pisang masak hijau " of Malay and Java. The following are the forms of " Klui hom " :—

1. " Klui hom tong " (tong=yellow), the ordinary form most commonly met with.
2. " Klui hom kieu " (kieu=green), the form which remains green when ripe. The flesh is softer and regarded by some as inferior to that of " Klui hom tong." Its keeping qualities are said to be inferior also.
3. " Klui hom kom " (kom=short) possesses a shorter but slightly plumper fruit than " Klui hom tong," but is otherwise similar.
4. " Klui hom chan " is a small form of the ordinary " Klui hom tong " with a little longer pedicel. The flesh is slightly more aromatic than the ordinary form. It is suspected that undersized fruit of " Klui hom tong " is sometimes known by this name.

The flavour of the different forms of " Klui hom " is excellent and the flesh of a fine uniform texture. It is in great favour particularly among Europeans as a dessert banana, though some Siamese express preference for other varieties.

### " Klui nam wa." (Plate V, fig. 3).

The most universally grown banana in Southern Siam is undoubtedly that known as " Klui nam wa." Of this variety there are two forms, one with a pale cream flesh and the other with the flesh tinged slightly pink. The fruit is rather short and stout—4 to 5

inches in length and  $1\frac{1}{2}$  inches in diameter. In colour it is pale yellow or buff. The flesh has a pleasant sweet, though slightly acid, flavour, but is of a rather tough consistency towards the centre. The fruit is inclined to break away at the pedicel when ripe. Should this factor be constant it would militate against its value as a shipping banana.

The preparation of sun-dried bananas was carried on in all the banana areas visited in Southern Siam, and on all the native markets dried bananas were one of the common commodities offered for sale. It is possible banana drying may only be satisfactorily carried out during the dry season. The best variety for drying is "Klui nam wa," and this variety is used almost exclusively. The fruit is peeled, halved longitudinally and allowed to remain in the sun until quite dry and powdery. The reason given for the preference shown for this variety for drying was that "it becomes neither too hard nor too soft when dry as did many of the other varieties."

In the Ban Pong district where bananas are cultivated on an intensive scale, this variety is grown almost exclusively. The conditions here are particularly hot and dry during a period of several months in the year and facilities for irrigating the bananas are absent. It was found that the Chinese cultivators were all of the same opinion regarding the hardness of the "Klui nam wa" variety, and stated that under their conditions it was the only variety that would thrive. Other varieties commanding a higher price, such as "Klui hom" and "Klui kai," had been tried but without success. The price obtained for bananas by cultivators in the Ban Pong area was 3 ticals per hundred hands ( $1 \text{ tical} = 1/10\frac{1}{2} \text{ d}$ ).

It is reported by residents in Siam that seeds are frequently met with in this variety. At Sriracha (E. Siam) two apparently normal seeds were found in one fruit by the writer.

"Klui humuk."

This is the variety most commonly used in Siam for cooking. A common sight in some of the streets of Bangkok is to see this banana being cooked at the small Siamese and Chinese food stalls. The usual method is for the fruit to be peeled, and then fried in oil, but frequently whole fruits are placed in the hot coals and "roasted in their jackets." When treated in this manner they invariably split down one side. It is also eaten in the uncooked state, however, and is the variety generally given to children and invalids, the softer rather watery flesh being regarded as more readily digestible than that of any other variety. When an infant reaches the stage of being able to take solid food the "humuk" banana, it is said, is one of the first forms of solid food given. The fingers are large and plump,  $6\frac{1}{2}$  inches in length and fully  $1\frac{3}{4}$  to 2 inches in diameter in the centre. The fruit is generally angular with five prominent ridges. The most characteristic feature is perhaps the very long thin pedicel (1 inch long). Towards the apex the fruit tapers gradually to a blunt point. The



colour when ripe is a pale yellow with a slight bloom. Pink colorations appear here and there in some cases, particularly where the fingers are in contact with one another on the bunch. The texture of the flesh is rather coarse and the flavour such as is not likely to appeal to the European palate.

“ Klui ferong.”

This is a well filled plump banana about 4 to 5 inches in length and almost completely cylindrical in shape. The flesh (cream) is soft and buttery and of good flavour: the skin being of medium thickness. The few bunches seen of this variety were small and lacking in compactness, though these may not have been truly representative of the variety. The name given to this variety (ferong=foreign) would seem to indicate that it has been introduced to Siam from elsewhere. It is similar to the variety known as “ Ptawbat ” or the “ butter banana ” in Burma.

“ Klui naak.”

This is the common red or bronze banana of Siam and no doubt corresponds to the “ Pisang rajah udang ” of Malay and Java, though the impression was received that it is slightly smaller in size. The fruit seen of this variety averaged 4 inches in length and  $1\frac{3}{8}$  inches in diameter, and is bluntly rounded at the apex. The flesh is yellow with a pleasant though very distinctive flavour. The belief commonly held by the Malays, that the red banana is responsible for skin complaints, appears to be quite non-existent among the Siamese.

“ Klui lep mu nang.”

This variety is interesting in that it is very distinctive and quite different from all other varieties seen in any of the other Eastern countries visited. The fruit is red when ripe and very slender. When peeled the fruit is barely the thickness of the little finger. This added to the fact that the flavour is poor no doubt accounts for the small extent to which the variety is grown.

#### BURMESE VARIETIES.

“ Thihmwe.”

One of the most noteworthy and widely grown varieties in Southern Burma is that known as “ Thihmwe.” This variety is equivalent to the “ Pisang embon ” of Malay and “ Klui hom ” of Siam. The common form is a greenish yellow when ripe, though a type with a good yellow colour is said to exist. Opportunity of seeing this type did not occur: it is apparently rather rare. “ Thihmwe ” is grown mostly in Southern Burma and is seldom encountered in the more northern areas where apparently it does not thrive. It does not appear to lend itself well to the rather specialized irrigation conditions prevailing in regions where intensive banana cultivation exists, as for example at Myittha.

Bunches with 8-10 large hands are the rule. The fingers are 7 to 8 inches in length, slightly angled and curved and lie parallel to one another throughout their length, forming a good compact bunch. The skin, which is of a medium thickness, is soft and the flesh a pale cream, almost white, of even soft texture and excellent flavour. The pseudostem is generally of a rather yellowish or mottled hue with dark markings on the leaf sheath below the point of attachment of the petiole. "Thihmwe" is regarded as one of the best of the Burma varieties, but requires a rich soil and sheltered position to thrive. At the Hinawbi Agricultural Station, in the delta area, eighteen months elapse from the time of planting to the production of fruit, but in areas with a more evenly distributed rainfall the period required would no doubt be less.

"Htaw-bat."

This variety, known also as the "butter" banana, is well represented on the Rangoon markets, but like "Thihmwe" is not encountered much in the north. It is known among Tamils in Rangoon as the "Rastali," and is very probably the same variety as the "Rastali" so extensively grown in parts of Southern India. The bunches seen were generally of medium size only, though the fruits were large and well filled—5 to 6 inches in length, and  $1\frac{1}{2}$  inches in diameter, with a very short pedicel. The skin is fairly thick and the flesh soft and buttery and of good flavour. According to Sawyer's classification of Burmese bananas this variety is classed as *M. sapientum* L. var. *Champa* Hort.

"Wet-ma-lut." (Plate VI, fig. 2).

"Wet-ma-lut." is one of the Canary forms (*M. Cavendishii*) and is grown a good deal and is in great favour in the Mandalay area. In some localities a superstition exists to the effect that the variety is sacred and that its cultivation by lay folk will bring bad luck, with the result that its cultivation may be more or less restricted to temple grounds. On ripening the fruit retains its green colour and is probably identical with the Cavendish forms "Pisang serandah" and "Pachawara" of the Malay Peninsula and Southern India respectively.

The size of the bunches produced by this variety in Mandalay during the dry season is surprising, bunches up to 4 feet in length being by no means uncommon. The bunches are, however, rather lacking in compactness with large intervals on the fruit stalk between the hands. The keeping qualities of the variety are regarded as poor, but this is compensated for as far as local consumption is concerned by the excellent quality of the fruit.

"Yakhine." (Plate VI, fig. 1).

This variety is largely grown in Burma and is similar to the "Klui-nam-wa" of Siam already described. According to Sawyer's classification this variety is classified as *Musa sapientum* L. var.



*arakanensis* Ripley. The opinion is held by some that this variety came originally from Arakan on the West Coast of Burma, a postulate which is supported by the Burmese name given to the variety.

An interesting feature about the variety is that it is seedless after first planting, but if the stool is left undisturbed for 3 or 4 years seeds invariably appear in the fruit. A marked difference is noticeable in the shape of the pseudostem according to whether the plants grow in clay or sandy soils. In sandy soils the pseudostems become much bulged at the base but in clay soils there is no bulging whatsoever.

#### “ Hpi-gyan.”

This is another common Burmese variety which has its equivalent among Siamese varieties in “ Klui humuk.” Owing to the rather poor flavour and shape of the fruit it can claim no consideration whatsoever as a shipping banana. This variety is probably cultivated to a greater extent than any other variety in Burma and is used largely for cooking. In the vicinity of Myittha, where banana cultivation is intense, “ Hpi-gyan ” and “ Yakhine ” are grown to the exclusion of all other varieties and the cultivators state that other varieties cannot be made to respond profitably under the conditions prevailing at Myittha.

#### “ Nanthabu.”

“ Nanthabu ” is one of the smaller fingered sorts and is characterised by the rather pronounced apex being slightly bent to one side and retaining a green colour after the rest of the fruit has turned yellow and is ripe. The bunches are light with 6 to 7 hands as a rule and the fingers 4 to 4½ inches long. The skin is of a medium thickness and tough and the flesh white with light brown markings throughout. The flavour can only be described as fair, though the keeping qualities are reported to be good.

#### “ Sen-Yan.”

This name means literally “ the elephant vomits ” and may have been given to indicate that the quality and flavour are so poor as to make even an elephant vomit ! The fruit is of medium size—4 to 5 inches, and the flesh fibrous and pithy with little or no flavour. It is essentially a cooking banana.

An interesting feature about the variety is the fact that the fruits, except those at the extreme ends of the hands, are all regularly four-angled, and quadrangular, not round, in cross section.

#### “ Shwe-hnget-pyaw.”

This is the red banana of Burma. It is not grown to a large extent and is probably to be met with more frequently in the South than in the North. It does not appear to differ in any way from the red banana of Siam and Malay.

## SOUTHERN INDIAN VARIETIES.

“Rastali.” (Plate VII, fig. 2).

“Rastali” is one of the well known varieties of Southern India, but should not be confused with the “Pisang rastali” of Malay and Java, from which it is quite distinct. The fruit is generally 5 to 5½ inches in length and 1½ to 1¾ inches in diameter and is very full when mature. The striations of the thin bright yellow skin of the fruit are coarser than is the general rule. The flesh is soft, fairly dry, of even texture and pleasant flavour. Bunches of 8 to 10 hands were found to be usual at Perugamani (near Trichinopoly) where the variety is largely grown. The hands have generally 16 to 18 fingers per hand and the bunches are compact and of good shape.

The variety has certainly many desirable features and should form a suitable shipping banana. Its carrying properties are undoubtedly good. Along with “Puven” it is packed in closed-in steel railway wagons with no packing material whatsoever, and despatched to various parts of Southern India, the journey taking possibly two or three days, and no protection from the hot sun is given.

“Puven.” (Plate VII, fig. 3).

This is probably the most commonly grown banana in Southern India. The fingers are usually 4 to 5 inches long and 1¼ to 1½ inches in diameter, with a rather pronounced apex, and the skin tough but of average thickness. The flesh is white and of fair flavour. Bunches are frequently large with up to 13 hands and 18–20 fingers per hand. They are also compact and appear to have good carrying qualities.

In the vicinity of Trichinopoly and Tanjore this variety may be seen cultivated to perfection and large quantities of the fruit are produced and despatched by rail or bullock cart to other centres in Southern India. The variety is also grown to a large extent on the Malabar coast.

“Pachawara.”

This banana (known also as “Nala muti,” meaning literally “that which touches the ground,” referring to the bunch) is a Cavendish of the type which remains green when ripe, similar to varieties seen in Burma and Malaya. According to information given by an Indian Agricultural Officer of long standing, cultivation of this variety has increased very much in recent years. Its early maturity compared with other varieties in part accounts for this popularity. Bunches of 9 to 10 hands were usual, the bunches being more compact than those of the Burma Cavendish. The “Mauritius Banana” is the term occasionally used by educated classes in Southern India to denote this variety.

On the fruit markets of Madras this variety, along with another known as “Puven,” figures more largely than any. It appears to



Fig. 1. Pachaladen, India.



Fig. 2. Rastali, S. India.

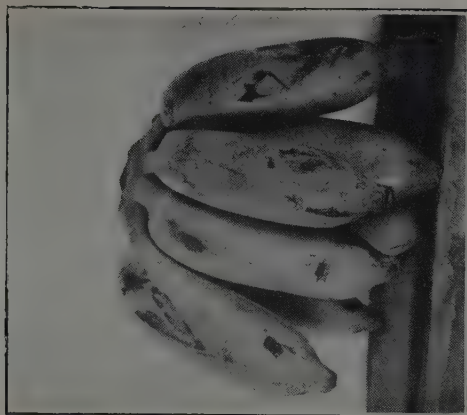


Fig. 3. Puven, India.





Fig. 1. Pisang lilan, Malay.



Fig. 2. *Musa malaccensis* Ridl., Malay.

be conveyed quite considerable distances by rail from where it is grown to Madras. In the banana growing area in the Cauvery River delta the variety is only occasionally to be seen, the varieties "Puven" and "Rastali" predominating.

"Pachaladen." (Plate VII, fig. 1).

The fruit of this variety is like that of "Pachawara" in that it remains green in colour on becoming ripe. It is, however, one of the tall-growing and not one of the dwarf forms. The variety was only seen on the Trichinopoly market and appears to be rather rare. Though of good shape with a fairly thick skin the fruit met with was lacking in flavour.

"Mysore."

The "Mysore" banana is grown a great deal on the Malabar coast. The fingers are usually  $3\frac{1}{2}$  inches in length and  $1\frac{1}{4}$  inches in diameter and have a pronounced apex. Ripe fruit is pale yellow with a pale yellow flesh, the central portion of which is darker in colour and jelly-like. In texture it is wet and soapy but of fair flavour. Large bunches of this variety were seen in the neighbourhood of Teleparamba. It is used largely for cooking in addition to being an eating banana.

"Sawara."

This is the red-skinned banana of Southern India. It is much relished and commands a high price on the Madras market and elsewhere. It does not appear to differ radically from the red forms recorded from the other countries visited.

"Nendren."

This banana, which is primarily one of the cooking class, is used to a certain extent as an eating banana in Malabar. The fruit may be 10 to 11 inches in length and  $2\frac{3}{4}$  inches in diameter, and is bright yellow when ripe. The flesh is coarse and of rather poor flavour, but is said to be at its best only when the fruit is allowed apparently to over-ripen and become black and decayed looking outwardly. The bunches are small and the fingers loosely arranged. This variety is called "the banana" among English speaking Indians in distinction from other cooking or eating varieties, all of which are commonly called "plantains," as is the practice throughout India and Burma. The terms "banana" and "plantain" have here, therefore, the very reverse meanings to those generally attached to them, where banana signifies the finer dessert or eating forms and "plantain" the large coarse forms which require to be cooked before eating.

CEYLON VARIETIES.

"Anamalu."

This is the variety in Ceylon corresponding to the "Jamaican" or "Gros Michel" and is represented in Malaya, Siam and Burma

(see table of synonyms, page 307). As in Siam, it exists in more than one form, the different forms being distinguished among growers by the addition of a descriptive prefix. These forms are known by such names as Gal-anamalu, Hapu-anamalu, Meegon-anamalu, etc. The differences are undoubtedly very slight.

The form "Hapumal-anamalu" or "Hapu-anamalu" remains green when ripe, and is therefore similar to the "Pisang masak hijau" of Malaya. Fruit seen was 7 to 8 inches long and  $1\frac{1}{2}$  inches in diameter, well shaped and of even thickness throughout. The quality of the flesh is good.

The fruit of "Gal-anamalu" is similar in shape to the above but of a good yellow colour. Very large hands with up to 21 fingers per hand are seen. Another distinct variety resembling somewhat the "Rastali" of Southern India was also known as "Gal-anamalu" by some cultivators in the neighbourhood of Kandy.

The "Anamalu" forms are regarded as inferior as eating bananas to other Ceylon varieties such as "Koli-kuttu" and "Hondarawala," and the belief exists among the natives that they are inclined to be unwholesome, causing windy complaints and are in consequence not as a rule given to young children.

#### "Koli-kuttu."

This is one of the favourite eating bananas and one of the most extensively grown. The fruit is well filled,  $1\frac{3}{8}$  inches in diameter,  $4\frac{1}{2}$  inches in length and bright yellow when ripe. The skin is of medium thickness and the flesh white, very dry and floury and of good flavour.

It is unfortunately one of the most susceptible varieties to "Bunchy Top" disease in Ceylon. One of the most resistant varieties is "Hondarawala," also a common variety in the Kandy district.

#### "Suwandel."

This is another of the most popular eating varieties and is regarded by some as superior to all others in Ceylon as a dessert banana. Up to 5 inches in length and  $1\frac{1}{2}$  inches in diameter, the fruit is characterised by a rather sharp apex. On becoming dead ripe the fruit becomes covered with small reddish brown spots. The skin is very thin, and the pale flesh of buttery consistency with a delicious aromatic sub-acid flavour. In the writer's opinion this is one of the most choice varieties to be encountered in the East.

#### "Ratembala."

This is the red-skinned banana of Ceylon and is identical no doubt with the red banana of Southern India and elsewhere. Some of the fruit seen was particularly well developed, 8 inches in length and 2 inches in diameter. It is seldom grown in Ceylon and is used mostly for ceremonial purposes, no doubt on account of the attractive and unusual colour.



“ Marthamalu.”

This variety so closely resembles “ Ratembala ” in all the characters of the fruit, except that of skin colour, that the possibility of its being a yellow form or bud mutant that has arisen from “ Ratembala ” is suggested.

“ Puwalu.”

“ Puwalu,” which has fingers about  $4\frac{1}{2}$  inches long and  $1\frac{1}{4}$  inches in diameter, is very similar to, and possibly identical with, the variety known as “ Puven ” in southern India. The flesh is white with a pleasant sweet flavour.

“ Navari.”

This is an extremely slender fingered variety and interesting in that it is quite distinct from any other variety seen in the East. The fingers are fairly straight, about  $4\frac{1}{2}$  inches long and  $\frac{3}{4}$  to  $\frac{7}{8}$  inches in diameter. The yellow skin is thick, with the result that when peeled the banana is no thicker than the little finger. The flesh is watery with a peculiar and distinctive though not unpleasant flavour.

In the few fruits opened one or two partly developed seeds were found. It would therefore not be unreasonable to expect that if fruit could be obtained over a wider range, viable seed might be obtained.

“ Alu kehel.”

This variety has the fruits covered with a thin layer of a white waxy substance and is similar to the “ Pisang abu ” of Malaya in this respect ; in fact from the shape, size and colour of the fruit there can be little doubt but that the two varieties are identical.

### Seeding Forms of Musa.

#### SPECIES OF MUSA INDIGENOUS TO BRITISH MALAY.

Apart from cultivated bananas, four distinct wild species of *Musa* occur in, and are indigenous to, Malay. Opportunity occurred of seeing two of these species growing in the wild state, one of which appears to be only slightly removed from some of the cultivated forms, as will be shown later.

The four species are—*Musa flava* Ridl., *M. violascens* Ridl., *M. malaccensis* Ridl. and *M. truncata* Ridl. The first mentioned is very rare and has only been recorded from two or three localities. *Musa violascens* Ridl. is rather small and has the inflorescence pointing straight upwards and not bent over as in cultivated forms. It is of no interest from the point of view of breeding work, being too far removed altogether from *M. sapientum* L. *Musa truncata* is stated to be a tall vigorous growing species closely resembling the cultivated banana in appearance and found only at higher altitudes in Malay. Unfortunately opportunity of seeing this species in the wild state did not occur.

*Musa malaccensis* is the most common of the wild species and is very prevalent in some areas, particularly in jungle clearings and along river banks. It appears to favour the richer granite soils and is one of the pioneer species in new clearings where it is sometimes found completely dominant or as a pure stand. The ripe fruit is subject to the depredations of birds, monkeys and other fruit-eating animals, and it was with some difficulty that a bunch of ripe fruit, or rather the remains of a ripe bunch, could be found. (Plate VIII, fig. 2).

The plant attains to quite a fair height (10-12 feet) in the most-favoured situations and can be picked out at a distance from the cultivated banana around native dwellings by the grey colour of the under surfaces of the leaves. Partially developed bunches of 7 and 8 hands and 17 to 19 fingers per hand were seen. The young fingers situated on the under surface of the bunch have a habit of twisting very much, so that their ends point upwards. The twisting is very pronounced, and is a character or peculiarity shared with the cultivated Malayan banana (seedless) known as "Pisang lilan" (lilan=candle) to which it is very similar. The young bunches of fruit of *M. malaccensis* and of "Pisang lilan" (Plate VIII, fig. 1) are barely distinguishable, and the habit—thin and slender—and general appearance of the two forms is also similar.

The leaf petioles have further this feature in common—they are almost perfectly circular in cross section with the two margins folding in on one another in a convolute fashion. This is a character not possessed by the majority of cultivated forms. These and other affinities which exist between these two types ("Pisang lilan" and *M. malaccensis*) suggest that the two are closely related and point to *Musa malaccensis* being the direct progenitor of "Pisang lilan," the seedless character having been attained gradually, possibly through selection exercised by early cultivators. Allied to "Pisang lilan" are one or two other similar, but by no means commonly grown, varieties, which possibly owe their origin to the same species. Among these are "Pisang klat barot" and "Pisang jarong."

The fruit of *M. malaccensis* is a muddy yellow when ripe and sometimes spotted with brown. In shape the fingers may vary from being almost straight (curved at pedicel only) to being much curved and rather abruptly pointed. The usual length is 4-4½ inches and ¾ to 1 inch in diameter, the fruit being well filled with the ridges barely noticeable. The pulp is cream in colour and sweet; numerous seeds exist throughout the entire length of the fruit. The small black seeds are sharply angled and rather irregular in shape. The skin comes away readily from the flesh when the fruit is thoroughly ripe.

An interesting seeding banana encountered in Johore is a variety known as "Pisang batu," the name meaning literally "stone banana," derived no doubt from the large number of seeds to be found in the fruit. This variety was seen in cultivation—a few





PLATE IX.

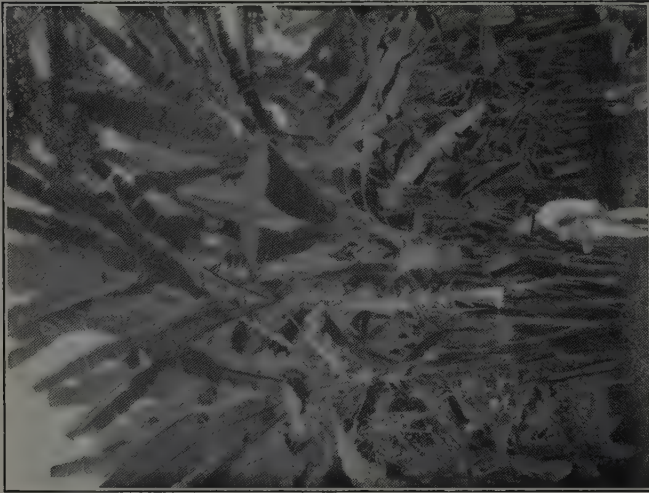


Fig. 2. *Musa Rumphiana* var. *paradisiaca*,  
Botanic Gardens, Buitenzorg, Java.



Fig. 1. *Musa brachycarpa*,  
Botanic Gardens, Buitenzorg, Java.

stools—at one locality in the neighbourhood of the township of Batu Pahat. In Malay fruit is used exclusively in the young stage, before the seeds harden, for cooking purposes. One of the methods whereby the Malays make use of the fruit is to cut it into thin slices and leave it to stand in water for some time, after which it is used as a curry ingredient.

This “Pisang batu” is probably identical with a seeding form known by the same name (Pisang batoe) in Java and described in some detail by Heyne. It was found, however, that this name was also used in parts of Java for a large seedless cooking banana similar to the “Klui humuk” of Siam.

In Java “Pisang batu” is put to a number of uses, some of which are no doubt common practice in Malay also. The stems cut up are used as food for water buffaloes and hogs, and for cattle also in times of scarcity, and the outer leaf sheaths when nearly dry are cut up into strips and used as binding material. The fibre contained in them is claimed to be of a superior, soft, silky nature, but the percentage is too low to warrant commercial extraction. Both in the green and the dry state the leaves are much used as packing materials. The sticky sap from the pseudostem mixed with soot is used for colouring bamboo plait work. According to Heyne it is only among the more primitive peoples of the Archipelago that the fruits of “Pisang batu” are regularly used as food, though they are frequently used medicinally.

#### SPECIES AT THE BOTANIC GARDENS, BUITENZORG.

At the Botanic Gardens at Buitenzorg several species of *Musa* native to various parts of the East have been established. These exist in the *Musa* plot as—*Musa Rumphiana* var. *paradisiaca*, *M. brachycarpa*, *M. Cliffortiana* var. *seminifera*, *M. Cliffortiana* var. *asperrima*, *M. zebrina*, *M. Basjoo*, *M. zebrina* var. *cerifera*, *M. glauca*, *M. sanguinea*, *M. mindanensis* and others. Of these the first four mentioned possess a tall erect habit and resemble most the cultivated banana in appearance. (Plate IX, figs. 1, 2).

The fruit bunch of *Musa Rumphiana* var. *paradisiaca* is rather striking in appearance. The fingers, which are tightly packed, are arranged in many hands extending down the full length of the fruit stalk. Pollen is produced very profusely by this variety.

#### SEEDING MUSAS IN SIAM.

Two types of banana that regularly form seed were encountered in Siam and are of particular interest on account of the large size of the bunches and fruit. These two types are very similar, so much so in fact that in some areas no differentiation is made by the natives and the name “Klui tani” is applied to both. It is more usual, however, for the two types to be distinguished and the names “Klui tani ban” (ban=compound, yard), and “Klui tani pa” (pa=forest, wild) to be given. (Plate V, figs. 1, 2).

The difference between these two types is not very pronounced. In habit " Klui tani ban " is slightly the larger and grows to a height of fifteen feet. The pseudostem is darker than that of " K. tani pa " and the fruits larger and less tightly packed with seed. Both are cultivated chiefly on account of the leaves, though not to a large extent. The leaves, cut into segments, are in great demand as wrappers for foodstuffs and other articles in bazaars, and are much favoured as holders or wrappers for cooking (boiling) special foods such as certain Siamese sweetmeats. The contention is held that, in contrast to other varieties, neither flavour nor colour are imparted by it to the foodstuff. The leaves are undoubtedly much tougher than those of the ordinary banana plant. The very young leaves dried are used as cigarette wrappers, and the heart or inflorescence bud is used extensively as a vegetable and is to be found for sale on most bazaars. This heart is utilised in much the same way as a cabbage, the inner pale coloured bracts only being eaten. It is quite free from any bitter principle which characterises the " heart cabbage " of most other varieties. The pseudostems are fed to stock, chiefly buffaloes, in some areas.

The fruit is not much utilised, and then only in the green state, the most common use being as a pickle. The young fruits are cut into thin slices and placed in vinegar to which a little salt is added. After standing for some days the pickle is ready for use. Another use for the young fruit is in curries. Care is taken to utilise only partially developed fruit before the seeds harden.

In " Klui tani ban " fingers are 6 to 7 inches long and 2 inches in diameter, and generally rather sharply angled. These angles or ridges are generally separated from one another at the apex of the finger by distinct furrows. The fruit is characterised by an unusually long pedicel, and a noticeable feature is the persistent style and corolla remains which adhere to the fruit right up to the ripening stage. The fruit turns yellow when ripe, but becomes quite soft when still partly green in colour. The pulp is white, watery and sweet, but it is not eaten in the ordinary way on account of the numerous seeds present.

All the fingers examined of this variety were distinctly six-locular and not three-locular as is customary in most species of *Musa*. These interesting seeding forms are regarded under the existing classification of the genus *Musa* as forms of *Musa sapientum* L. However, it should be pointed out that the wild Musas of Siam have not as yet been fully worked out and subsequent classification may lead to isolation of these two types. Be this as it may, it is felt that these forms might be of value in breeding work, possessing as they do suitable characters as regards habit, size of bunch, size of fruit, etc., and probably disease resistance.

#### SEEDING SPECIES OF MUSA IN BURMA.

In Burma there appears to be no seeding form of banana that is in regular use or cultivated such as the " Klui tani " of Siam. There



are, however, wild species of *Musa* occurring in the jungle in certain localities. Of these *Musa glauca* Roxb. was found to be very common in a forest reserve near Toungoo, where another species was encountered. In habit these two species are smaller and more slender than the cultivated banana, but in the case of the second, bunches of quite fair size may be produced.

#### Notes on Cultivation, Diseases, etc.

The methods of cultivation adopted in the countries visited were not found to vary as much as might have been expected. Where bananas were grown as a field crop, as opposed to two or three stools only in a compound or back yard, the methods adopted belonged to one of two systems, according to whether a more or less continuous rainfall and growing season prevailed, as in Malay and Ceylon, or whether a hot, dry season existed over a part of the year and irrigation was resorted to, as in parts of Burma and India. In any area where bananas were grown on an intensive scale it was always found that cultivation was limited to one or two varieties only, whereas in those areas where field scale cultivation did not exist a greater number of varieties were always to be met with in compounds and intermixed with other crops.

Five or six miles from Jelibu in the State of Negri Sembilan, Malay, several hundred acres of bananas, cultivated as a pure stand, and Chinese-owned, were in existence. The growth of the plants on the leached hill slopes was very much inferior to that of those on lower-lying alluvial situations and the incidence of disease more marked. "Pisang embon" and "P. maas" were the only varieties cultivated, and the whole of the output was conveyed to the larger centres for consumption. That considerable damage was being done by a vascular disease of some sort there was no doubt, and it was the opinion of the Assistant Mycologist, Agricultural Department, who had been investigating banana diseases in Malay for some months, that the symptoms at Jelibu were suggestive of more than one disease being present. In some cases the pseudostems of infected stools showed a marked red or red-brown discolouration of the vessels, and deep splitting of the pseudostems was occasionally seen, accompanied by premature wilting and breaking down of the leaves. In other cases the brown discolouration was quite absent but the central portion of the pseudostem was of a discoloured grey appearance.

It is interesting to record that in this area "P. embon" only was attacked, "P. maas" being apparently immune to the disease. This observation was confirmed by information obtained from local squatters who stated that "P. maas" was not affected, and that more and more of this variety was therefore being grown by them. The wild banana *Musa malaccensis* Ridl. was common in this disease-infected area along paths and the river bank, but nowhere was there evidence of its being attacked.

The skipper caterpillar (*Erionota (Hidari) thrax*) was very troublesome in parts of Malay and a serious pest to banana cultivation

in some areas. Patches of bananas were frequently met with almost completely defoliated by it; nor did the wild species of *Musa* escape its depredations. Though so common in Malay it was not noticed to any extent in other countries visited.

The common banana beetle borer (*Cosmopolites sordida* Chevr.) was everywhere encountered. In many instances it was difficult to find stools from which to obtain suckers that were not infested. The ramifications of this pest in the East appear to be quite independent of climatic and environmental conditions.

In western Johore, bananas are extensively grown on some of the low-lying flats, the cultivators being in many cases immigrant Javanese. On these flats a heavy black clay soil abounds, and it is only by the efficient upkeep of a most elaborate drainage system that takes the form of a network of canals, that cultivation of any sort can be carried on, the elevation being almost sea level. Given good drainage and good cultural treatment this heavy soil is remarkably productive and excellent yields from bananas were witnessed. The spacing afforded the plants was found to vary a good deal on different holdings. In planting out, large suckers or offsets are selected, and after the leaves have been removed and rootstock trimmed, they are allowed to lie for a day or two, to dry off partly no doubt, before being planted out in prepared holes. In the course of a few weeks leaves appear and all the attention the plants then receive is to have the dead leaves removed and soil round the roots occasionally loosened and kept tolerably free of weeds.

In the eastern portion of the island of Java, at Banjoewangi for instance, bananas are grown for export to Western Australia. The varieties grown are "Pisang embon" and "Pisang hijau" chiefly, though in 1924 success was obtained with a third variety "Pisang songgroito." According to Ochse (Landbouw, Juli 1925, bl. 20, en Jan. 1926, bl. 321) the plants are spaced 4 metres by 5 to allow of the cultivation of subsidiary crops between the rows. In the second year a bunch of fruit is obtained from each stem, and from the second year onwards two bunches are obtained from each stool. After the sixth year replanting is generally effected, young plants being established the year previous between the old rows in order to avoid having a year without fruit. The fruiting period can be regulated to a certain extent, to suit market demands, by regulating the period during which suckers are removed, but it is dependent also upon soil conditions and rainfall. The growing period here is estimated at 14 months, and the bunches are cut when the fruit is fully developed though still green. The export of bananas from Java to Australia during the period 1918/25 is given by Ochse as 90, 114, 104, 125, 130, 119, 138 and 164 thousand bunches. The fruit is said to be packed in wooden crates, the voyage lasting about 6 days.

In Siam bananas are generally grown in mixed cultivation with other crops or interplanted between fruit trees, and in only a very few localities are they grown as a pure stand. Around Bangkok

and along the banks of the Menam chau river in the lower reaches where the ground is very low lying and flat, cultivation of bananas and other fruits is generally carried out on wide ridges or strips of land surrounded on either side by irrigation or drainage canals. Remarkably good crops are in some cases obtained.

Bananas are cultivated as a field crop in the neighbourhood of the railway in parts of southern or peninsular Siam, particularly around Ban Pong and Rajburi, where several hundred acres exist—the fruit being disposed of mainly on the Bangkok markets. One variety, “Klui nam wa,” is grown almost exclusively throughout this area and is claimed to withstand the conditions prevailing in the dry season far better than any other variety. The prevailing soil is of a lateritic nature with the appearance of being deficient in humus and liable to rapid drying out. In planting out the suckers are evenly spaced and planted in rows, and appear to receive a fair amount of attention from the resident Chinese owners.

On the whole the banana areas visited in Siam were found to be singularly free from fungoid diseases and insect pests, with the solitary exception of the beetle borer (*Cosmopolites sordida* Chev.), though it must be remembered that conditions during the dry season only were witnessed. The only sign of serious fungus disease was met with at Bangkok-noi. Here in a rather badly drained area a disease causing a greyish discolouration of the pseudostem and dying back of the outer leaves was prevalent, young suckers up to 2 feet in height being attacked in addition to mature plants.

In Burma the general run of banana cultivation was found to be very much the same as in peninsular Siam, but in a few localities where large areas were cultivated occasional special features were noticed. Near Myittha, where open semi-savannah country prevails, bananas were being grown on a large scale by Burmese cultivators. The ground used was rich, flat paddy land, and irrigation from a neighbouring river was possible, one to three waterings per month being given during the dry season, according to circumstances. At the time of the visit the fields were perfectly clean of weed growth and the soil surface in a good state of tilth. For planting six months old suckers are used, and are planted in rows at about 500 per acre. Fruit is obtained one year after planting, and as soon as the bunches have been reaped the area is replanted. It was stated that no manuring whatsoever was practised in this area, but that after three years rotation with paddy would be effected. The fruit, which is of the varieties “Hpigyan” and “Yakhine,” is sold to dealers, who buy in on the spot and forward it to the larger centres, the price paid being usually about R.70 (1 R=rs. 6d.) per 1000 hands. A leaf fungus, *Macrophoma Musae* (Cooke) Berl. & Vogl., was found to be common on the bananas in this area. It did not, however, appear to be the cause of any serious damage and was restricted in all cases to the dead and dying leaves at the base of the crown: in no instance was it found on young leaves. At Myittha the cultivators did not make a practice of

cutting away the dead leaves hanging from the pseudostems as is so often done, and argued that during the dry season these dead leaves are a protection to the stem of the plant.

Farther south in Burma, near Piasca, some ten or twelve miles from Toungoo, a different type of banana cultivation over quite a large area was found to exist. This was practised on the somewhat intersected lower slopes of river valleys on what had not long since been wooded or forest land. The soil was a rich alluvium for the most part and stony. Stools had been established in no regular order, but where situation suited. The plants were all in a thriving condition and good yields obtained. The variety grown was almost entirely the more choice "Thihmwe," a contrast to Myittha, where the two coarser varieties only were grown.

In southern India bananas appear to be grown in all districts with the exception of those at the higher altitudes. In some areas, notably around Trichinopoly and Tanjore and parts of the Malabar coast, large acreages are devoted exclusively to this crop. In these areas cultivation is generally on "wet" lands, and the stools are allowed to remain in the ground three or four years before being removed. In parts of the Cauvery river delta examples of bananas cultivated more or less to perfection were to be seen. The conditions under which the bananas were grown and the attention meted out to them surpassed those seen in any other part of the East. Excellent irrigation facilities prevailed, the soil being a dark deep loam. A large proportion of the fruit produced is despatched by rail or bullock cart to other centres in southern India. Suckers are planted at distances of from 6 to 10 feet, and only one new sucker is allowed to replace the parent one. When the plants reach the bearing stage and the bunches of fruit are developing, each stem is supported by a stout bamboo stake. This is an essential safeguard against wind which sometimes causes much damage, the variety "Puven" being, it is stated, particularly subject to damage in this way. The practice of removing the aggregation of terminal bracts and male flowers at the end of an inflorescence, or heart, when bunches are half developed, is commonly resorted to by Indian cultivators.

In Malabar a coarse cooking banana "Nendren" is grown all along the coast, and receives rather different cultural treatment from other varieties. Replanting is effected as a rule after each season, as very poor yields are said to accrue from ratoon suckers with this variety. Where irrigation is not possible watering by hand during the dry season is done, two or three waterings per month being given and loose soil heaped up round the base of the pseudostem after each watering. Liberal dressings of manure, mostly pig, are given.

In Ceylon banana cultivation is at present seriously affected by the presence of "Bunchy Top" disease, regarded as being identical with the "Bunchy Top" that has caused such damage to banana growing in Queensland. It occurs more or less throughout the island and is being investigated by the Department of Agriculture in Ceylon.



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## XLIX.—CONTRIBUTIONS TO THE FLORA OF BURMA : VI.\*

***Illicium manipurense* Watt** [Magnoliaceae].

Known from Manipur.

Naru Bum, hills of the Bhamo district at 7,800 feet, March 1927, *Maung Mya* 5327. "Middle-sized tree. Flowers white scented."

***Kayea assamica* King et Prain** [Guttiferae].

Known from Assam.

Pidaung Reserve, Myitkyina district at 530 feet. Flowers March, *Maung Mya* 5350. "Tree, stem brownish with white patches. Flowers white, anthers yellow."

***Gordonia anomala* Spreng.** [Ternstroemiaceae].

Known from South China.

Spur of Shangtai Bum at about 6500 feet, Bhamo district March, *Maung Mya* 5322 and 5321. "A middle-sized tree, large at times, stem greyish-white. Flowers white."

***Sterculia Roxburghii* Wall.** [Sterculiaceae].

Known from Sikkim, Silhet and Assam.

Malikha, Myitkyina district at 750 and 3100 feet, flowers March; fruit June, *Maung Mya* 5385 and 5461. "Tree. Flowers and fruits red."

***Acer laevigatum* Wall.** [Aceraceae].

Known from the outer Himalaya from Garhwal to Sikkim and the Khasi hills.

Lahpyekha, hills of the Bhamo district at 6500 feet, March 1927, *Maung Mya* 4981.

***Acer sikkimense* Miq.** [Aceraceae].

Known from Sikkim, Bhutan and the Mishmee hills.

Hills of the Bhamo district at about 6000 feet, March 1927, *Maung Mya* 5313 and 5336.

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\*Continued from K.B. 1928, p. 47.



**Gymnocladus burmanicus** *C. E. Parkinson* [Leguminosae-Eucaesalpinieae]; affinis *G. chinensi* Baill., sed foliolis lanceolatis, apice acutis et calyce paene glabro differt.

A deciduous tree attaining 17 m. in height and 1.5 m. in girth; bark brown with transverse lines. *Leaves* equally bipinnate, the rachis about 20 cm. long, shortly and sparsely pubescent to glabrescent, with usually 3 pairs of opposite or sub-opposite pinnae 8-15 cm. long. *Leaflets* alternate, 7-10 pairs on each pinna, 4-6 cm. long, 0.5-1.5 cm. wide, the lower ones ovate lanceolate and unequal-sided at base, the upper ones lanceolate or narrowly so, their bases narrowed, apex (of all leaflets) acute to a point, when young with scattered short adpressed hairs to almost glabrous when mature, midrib prominent, secondary nerves and reticulations less prominent; petiolules 0.2 cm. long with short pointed stipels under them. *Inflorescence* a short terminal raceme, the rachis, pedicels, and calyx very shortly and sparsely pubescent; bracteoles short, filiform and pubescent. *Flowers* reddish-brown, pedicels 1-1.3 cm. long. *Calyx* narrowly funnel-shaped, 0.7 cm deep, the 5 narrow lobes 0.5 cm. long. *Petals* oblong, pale-pubescent, 0.8 cm. long. *Stamens* 10 alternately longer and shorter, the longer ones opposite the calyx lobes and about as long as them, filaments narrowed upwards, anthers ovate. *Ovary* glabrous, with few ovules, style exserted, stigma slightly oblique. *Fruit* about 8 cm. long and 3 cm. wide, oblong, compressed, with a reddish-brown polished pericarp and few (2 or 3) black oblong ovoid seeds.

Ta-ok plateau, Dawna hills of Tenasserim in Lower Burma at 3500 feet, *C. E. Parkinson* 5229. Leafless about the month of January. Flowers in February with the conspicuous new reddish foliage. The fruits have a strong smell of stale bananas when ripe and are said to be used by Karens for making a hair wash. The seeds are extremely hard. Vernacular name:—*Mya-pe-ler* (Karen).

**Nyssa bifida** *Craib* [Nyssaceae].

Known from Siam.

Misty Hollow, Dawna hills of Tenasserim at 2400 feet. Flowers February, *C. E. Parkinson* 5282. "Tree 50 to 60 feet high. Flowers pale-greenish."

**Craibiodendron Henryi** *W. W. Smith* [Ericaceae].

Known from Yunnan.

Lahpye Kha, Hills of the Bhamo district at 6500 feet. Flowers March, *Maung Mya* 4985.

**Styrax polysperma** *C. B. Clarke* [Styracaceae in Fl. Brit. Ind. iii. 590; in monographia *Styracacearum* auctore cl. J. Perkins (Das Pflanzenreich) inter Sect. i. *Eustyrax*, Ser. 2 *Imbricatae* prope *S. odoratissimum* ponenda].

C. B. Clarke based this species on the rather incomplete material collected in Khasia by J. D. Hooker and T. Thompson and by Griffith. Miss J. Perkins, owing to the imperfectness of Clarke's material, excluded the species from the *Styracaceae* in her monograph and referred it, as had been previously done (Fl. Brit. Ind. l.c.), to the family *Boraginaceae*. Flowering specimens recently collected in the Myitkyina district of Upper Burma show that C. B. Clarke was right in describing the plant under *Styrax*. An amplified description is herewith given.

A *tree*. Leaves with obscurely crenate margins; venation fine. Flowers white, nearly sessile, in terminal and sub-terminal panicle corymbs 3-6 cm. across, the branches of the inflorescence shortly pale stellate-pubescent in their younger parts. *Calyx* small, 0.3 cm. long and 0.4 cm. across, cup-shaped, shortly pale-tomentose outside and with a few short straight hairs within, teeth 5, triangular. *Corolla* 0.8 cm. long, 5-partite, the lobes imbricate, ovate, the tube shorter than the lobes, densely and shortly pale-tomentose outside and rather less so within. *Stamens* 10 in a ring on the corolla-tube; filaments 2 cm. long, flattened, with short hairs at the base on their inner side; anthers ovate, introrse, 0.2 cm. long, those of the stamens opposite the corolla rather smaller. Ovary glabrous, depressed-globose, 3-celled with about 5 or 6 ovules in each cell; style 0.4 cm. long, obscurely 3-lobed.

Myitkyina District, Lima hills at 4000 feet, *Maung Mya* 5376. "The old leaves turn pinkish-red before falling."

***Alstonia venenata* R. Brown [Apocynaceae].**

I refer the Burmese specimens, which are glabrous, to the older (1911) and geographically more remote species *A. venenata* of S. India. *A. neriifolia* D. Don (1825) from the E. Himalaya and Yunnan hardly appears to be specifically distinct.

Gokteik Gorge, Northern Shan States, 3000 ft. June, C. E. Parkinson 6152.

***Ecdysanthera multiflora* King et Gamble [Apocynaceae].**

Known from the Malay Peninsula.

Tavoy, Nwalabo, 2000 feet, Oct., R. N. Parker 2305.

"Extensive climber with milky juice. Twigs rough with small raised lenticels, flowers white." Vernacular name:—*Sit Kyauk*.

***Beilschmiedia sphaerocarpa* Lecomte [Lauraceae].**

Known from CochinChina.

Mergui, bank of the Little Tenasserim River, Dec., R. N. Parker 2331. "Flowers green." Vernacular name:—*Thwegyo*.

***Scleropyrum Ridleyi* Gamble [Santalaceae].**

Known from the Malay Peninsula.

Mergui, Lpanthaung on the Little Tenasserim River, Dec., R. N. Parker 2334. "Small tree 30 ft. high, 8 in. diam. Flowers

greenish-white with an unpleasant smell. Racemes often from thick leafless branches. Stem with thick spinescent branches." Vernacular name :—*Myetsat*.

**Sapria himalayana** Griff. [Rafflesiaceae].

Near Mulayit peak, Dawna hills of Tenasserim at 4000 ft. Unopened flowers were obtained in March 1927, open flowers would appear to be available about the month of May. It is known from the Himalayan region in the vicinity of the Mishmee Hills, from Northern Burma (Rec. Bot. Surv. Ind. x, 346) and from Northern Siam. It is possible that this is the plant (*Rafflesia*) referred to in the Botany of the Indian Empire, Imperial Gazetteer of India, i. 203.

**Glochidion obscurum** Bl. [Euphorbiaceae].

Known from China, the Malay Peninsula and Malayan Islands. Mergui, Chaungnaukpyau, Dec., R. N. Parker 2346. "Small tree 6 m. high. Common in open scrub."

**Galearia pedicellata** R. Br. [Euphorbiaceae].

Known from the Malay Peninsula.

Mergui, Chaungnaukpyau, Dec., R. N. Parker 2348. "Shrub 1.2 m. high in open scrub forest." Vernacular name : *Wuntiche*.

**Endospermum chinense** Benth. [Euphorbiaceae].

Known from China.

Forests in the vicinity of Pidaung and Mogaung at about 800 feet, Myitkyina District. Flowers May, fruit June, *Maung Mya* 5440, 5469. "Large tree. Stem whitish-brown. Flowers white." Vernacular name :—*Okalaput pun* (Kachin).

**Ficus nemoralis** Wall. [Moraceae].

Known from the Himalayas from Hazara to Assam and the Khasi hills.

Lahpye Kha, hills of the Bhamo District at 6500 ft., March, *Maung Mya*, 4983

**Hedychium elatum** Rosc. [Zingiberaceae].

Known from the Eastern Himalayas.

Maymyo Plateau, 3500 ft., Sept., C. E. Parkinson 2094. "Erect, herbaceous, 3-4 ft. high. Flowers white, bases of petals pale-pink, filament pink." Vernacular name :—*Pha-hla*.

**Iris Clarkei** Baker [Iridaceae].

Known from Sikkim.

Bhamo, North West of Lweje, 3300 ft., March, *Maung Mya* per C. E. Parkinson 5308. "Hygrophyte 1 ft. 2 in. high. Flowers indigo-blue; stem erect, smooth, green, without rootstock. In valley between hillocks."



***Crinum Wattii* Baker** [Amaryllidaceae].

Known from Manipur.

Amherst, Wekwa Chaung, 150 ft., Jan. *C. E. Parkinson* 5010.  
"Water plant 1-2 ft. high. Flowers white, stamens and base of perianth purplish; leaves dark purplish."

**L.—MISCELLANEOUS NOTES.**

The following appointments have been made by the Secretary of State for the Colonies:—MR. H. R. HOSKING, B.Sc., A.R.C.S., Assistant Cotton Botanist, Uganda; MR. A. H. SAVILE and MR. N. V. ROUNCE, Agricultural Officers, Tanganyika Territory; MR. E. R. GUEST, B.Sc., A.R.C.S., Plant Breeder, Iraq.

MR. E. PHILLIPS TURNER.—We record with pleasure the appointment of Mr. E. Phillips Turner as Director of Forestry, New Zealand, in succession to Mr. L. M. Ellis, who recently resigned that office.

Mr. Phillips Turner is an Englishman by birth. In 1886 he was an Assistant on the Survey of the Railway from the Waikato to Rotorua, and made a careful survey on foot of the country the day after the eruption of Mt. Tarawera and Lake Rotomahana. In 1908 he was appointed Inspector of Scenic Reserves for the Dominion. This post enabled him to travel all over New Zealand and he acquired a wide knowledge of the Vegetation and Forests of the Dominion. When the Forestry Department was created as an independent Department, in the year 1919, Mr. Phillips Turner was made the head of it with the title of Secretary of Forestry. The following year the Department was reorganised as the State Forest Service, Mr. Ellis being made Director, with Mr. Phillips Turner as permanent head in charge of the Administrative side as Secretary of Forestry.

He has written valuable reports on the Botany of the higher Waimarino and on the re-vegetation of Tarawera Mountain. His keen botanical interests in addition to his love of scenic beauty should be of great value to the Dominion in his new post.

FRANK J. EVANS.—We record with regret the death of Mr. F. J. Evans in Trinidad. Mr. Evans entered the Royal Botanic Gardens, Kew, in March, 1902, and left in June, 1903, to take up the post of Assistant Superintendent of the Royal Botanic Gardens, Trinidad (*K.B.*, 1903, p. 31). In 1912 he was appointed Assistant Superintendent in the Agricultural Department, Southern Nigeria (*K.B.*, 1912, p. 300). Three years later he was placed in charge of the various Plantations in the Cameroons and carried on his duties with conspicuous efficiency until the Estates were sold a few years ago. He then returned to Trinidad to take over the Perseverance Estate, but he was in poor health and died on August 9th after a long illness.